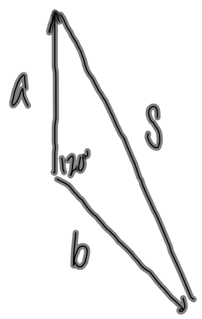
35.



$\frac{da}{dt} = 14$ knots $\quad \frac{db}{dt} = 21$ knots

find $\frac{ds}{dt}$ $\quad a=5 \quad b=3$

$s = \sqrt{5^2+3^2+5\cdot 3}$

$s=7$

law of cosines

$s^2 = a^2 + b^2 - 2ab\cos 120°$

$s^2 = a^2 + b^2 + ab$

$2s\frac{ds}{dt} = 2a\frac{da}{dt} + 2b\frac{db}{dt} + a\frac{db}{dt} + b\frac{da}{dt}$

$\cancel{2\cdot 7}\cdot\frac{ds}{dt} = \frac{2\cdot 5\cdot 14 + 2\cdot 3\cdot 21 + 5\cdot 21 + 3\cdot 14}{14}$

$\frac{ds}{dt} = 29.5$ knots

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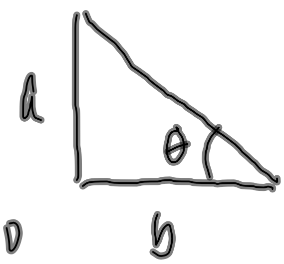
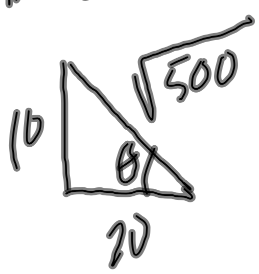
34.



$\frac{da}{dt} = -2\frac{m}{sec} \quad \frac{db}{dt} = 1\frac{m}{sec}$

$a=10$

$b=20$



$\tan\theta = \frac{a}{b}$ implicit diff.

$\cancel{\sec^2\theta}\cdot\frac{d\theta}{dt} = \left[\frac{b\frac{da}{dt} - a\frac{db}{dt}}{b^2}\right]\cos^2\theta$

$\frac{d\theta}{dt} = \left(\frac{20\cdot(-2) - 10\cdot 1}{20^2}\right)\left(\frac{20}{\sqrt{500}}\right)^2$

$= -.1\ \frac{\cancel{rad}}{sec} \quad \frac{360°}{2\pi\ rad} = \boxed{-6\frac{°}{sec}}$

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$$\frac{x}{6} \cancel{\times} \frac{x+y}{16}$$

$$16x = 6x + 6y$$

$$10x = 6y$$

$$\cancel{10}\frac{dx}{dt} = \frac{6}{10}\frac{dy}{dt}$$

$$= \frac{6}{10}(.-5)$$

$$= -3 \ \cancel{ft}/sec$$

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47. $y = uv$ find $\frac{dy}{dt}$

$$\frac{dy}{dt} = u\frac{dv}{dt} + v\frac{du}{dt}$$

$$= u\,.\overset{.03}{\cancel{05}}v + v(.\overset{-.02}{\cancel{04}}u)$$ inc.

$$\frac{dy}{dt} = .\overset{.01}{\cancel{09}}uv = .\overset{.01}{\cancel{09}}y$$

49.

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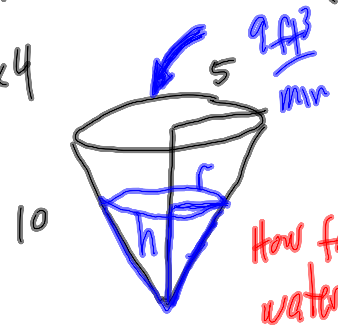
4.6 more ~~stuff~~ related rates!

Ex 4



$\frac{dV}{dt} = 9$

How fast is the water level rising $\Rightarrow$ find $\frac{dh}{dt}$

$V = \frac{1}{3}\pi r^2 h$

similar Δ's

$\frac{r}{h} = \frac{5}{10}$ so $r = \frac{h}{2}$

$V = \frac{\pi}{3}\left(\frac{h}{2}\right)^2 h = \frac{\pi}{12}h^3$

$\frac{dV}{dt} = \frac{3\pi}{12} h^2 \frac{dh}{dt}$

$\cancel{9} = \frac{\pi}{\cancel{4}} \cancel{6}^2 \frac{dh}{dt}$

$1 = \pi \frac{dh}{dt}$

$\frac{dh}{dt} = \frac{1}{\pi} \frac{ft}{min}$

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